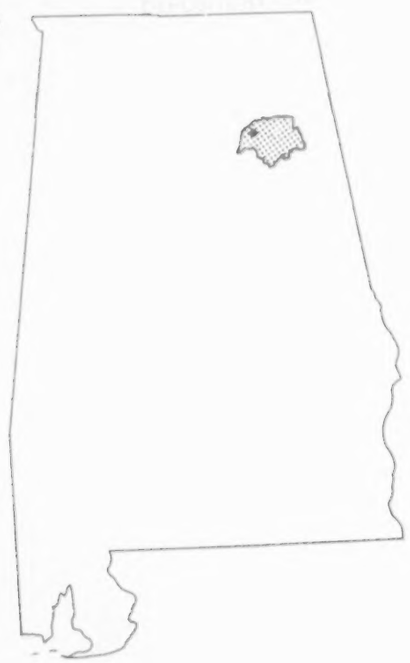
010252

FLOOD INSURANCE STUDY

TOWN OF WALNUT GROVE, ALABAMA
ETOWAH COUNTY



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PUBLISHED SEPARATELY:

Flood Insurance Rate Map

FLOOD INSURANCE STUDY
TOWN OF WALNUT GROVE, ALABAMA

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Town of Walnut Grove, Etowah County, Alabama, and aids in the administratioon of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the Town of Walnut Grove to the regular program of flood insurance by the Federal Insurance Administration (FIA). Local and regional planners will use this study in their efforts to promote sound flood plain management.

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than those on which these Federally-supported studies are based. These criteria take precedence over the minimum Federal criteria for purposes of regulating development in the flood plain, as set forth in the Code of Federal Regulations at 24 CFR, 1910.1 (d). In such cases, however, it shall be understood that the state (or other jurisdictional agency) shall be able to explain these requirements and criteria.

1.2 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by Law Engineering Testing Company for the Federal Insurance Administration, under Federal Emergency Management Agency Contract No. H-4636. This study was completed in September 1979.

1.3 Coordination

Streams requiring detailed study were identified at a meeting in March 1978, attended by representatives of the study contractor, FIA, and Walnut Grove.

Contact was maintained during the course of this study with the East Alabama Regional Planning and Development Commission, the Mobile District of the U.S. Army Corps of Engineers (COE), the United States Geological Survey (USGS), the Soil Conservation Service (SCS), and the Town of Walnut Grove.

On April 10, 1980, the results of the study were reviewed at the final meeting attended by representatives of the study contractor, FIA, and community officials. The study was acceptable to the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Walnut Grove. The area of study is shown on the Vicinity Map (Figure 1).

The limits of detailed and approximate studies in Walnut Grove were determined by FIA with community and study contractor consultation at the meeting in March 1978.

Floods caused by overflow of the Locust Fork of the Black Warrior River within the corporate limits and Payne Branch from the confluence with Locust Fork to another confluence some 4500 feet upstream were studied in detail.

The areas studied by detailed methods were selected with priority given to all known flood hazard areas, and areas of projected development or proposed construction for the next five years, through September 1984.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards. The scope and methods of study were proposed to and agreed upon by FIA, and the Town of Walnut Grove.

2.2 Community Description

The Town of Walnut Grove is located in the western section of Etowah County, Alabama. It is approximately 80 miles northeast of Birmingham and 20 miles west of Gadsden along U.S. Highway 278. The town has an area of approximately 3.5 square miles and a population of 487 (Reference 1).

Walnut Grove is a small retirement community. There are no major businesses or industries. Agriculture production is limited to a few small private farms.

The town is drained by Locust Fork of the Black Warrior River and Payne Branch, and their tributaries. The general direction of flow through the town is north.

The area is favored with a temperate climate. The average winter temperature is 44 degrees F and the average summer temperature is 80 degrees F resulting in an annual average of 62 degrees F. The average rainfall is 58 to 60 inches annually.

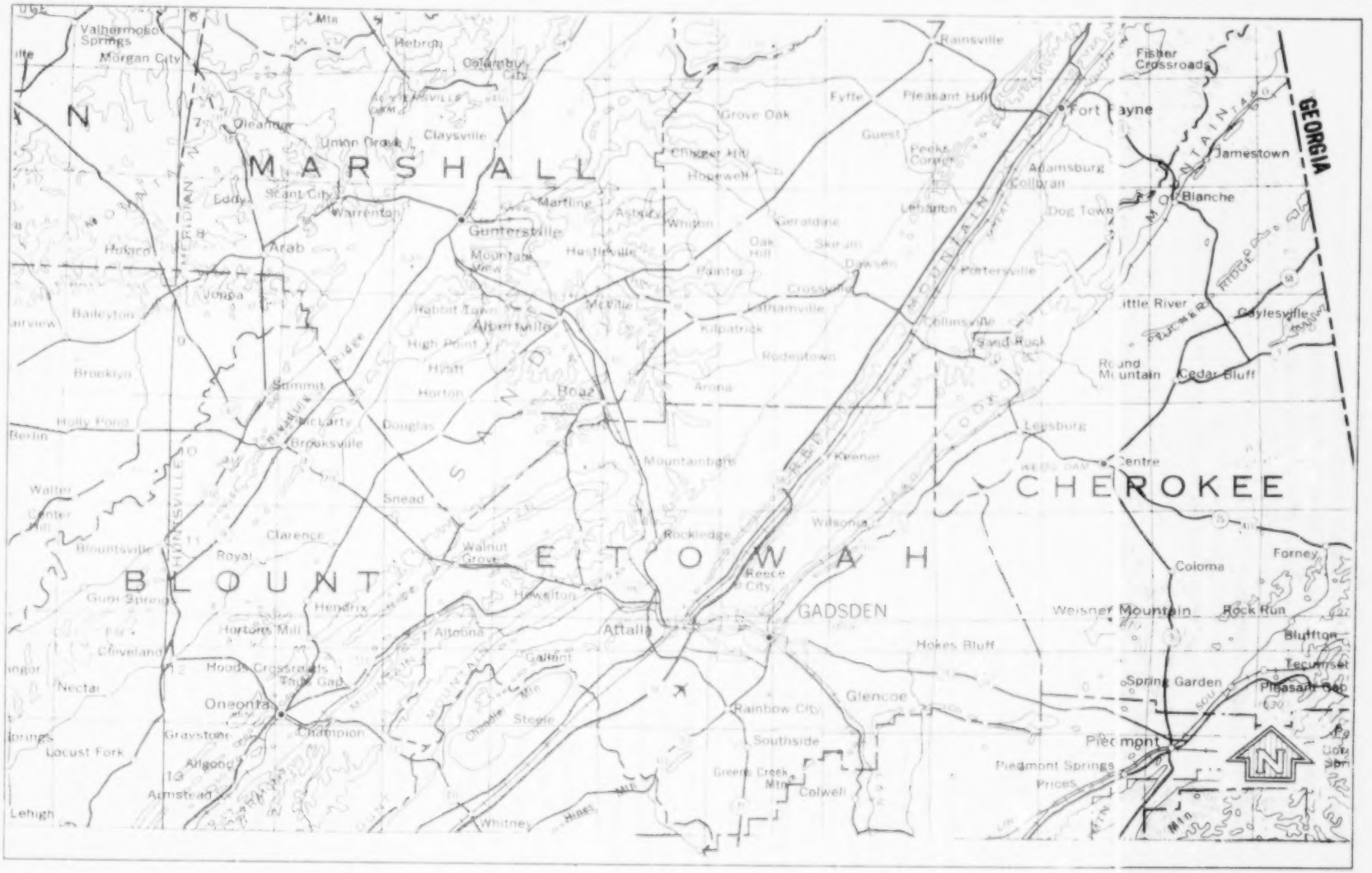


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

Federal Insurance Administration

TOWN OF WALNUT GROVE, AL

(ETOWAH CO.)

APPROXIMATE SCALE

8 0 8 16 24 MILES

VICINITY MAP

2.3 Principal Flood Problems

Flooding in Walnut Grove mostly occurs along Locust Fork. Very little damage has been recorded. The river has a wide natural floodplain and very few structures have been erected adjacent to the stream.

2.4 Flood Protection Measures

At the present time, there are no flood protection measures affecting the Town of Walnut Grove.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, and 500-year period (recurrence intervals), have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term, average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than one year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (one percent chance of annual occurrence) in any 50 year period is about 40 percent (four in 10), and for any 90 year period, the risk increases to about 60 percent (six in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish peak discharge-frequency relationships for floods of the selected recurrence intervals for each flooding source studied in detail in the community.

Equations have been developed by Olin and Bingham (Reference 2) for estimating peak flows for the 10-, 50-, and 100- year floods on natural streams in Alabama. These flows were used on streams with drainage areas of 1 to 15 square miles. Flood frequency relationships developed by Hains (Reference 3) were used for the stream when the drainage area was between 25 and 800 square miles. When the watershed was between 15 and 25 square miles, peak flows were computed by combining the two methods using a weighted average based on drainage area. The 500-year flows were determined by extrapolating the 10-, 50-, and 100-year peak flows using a least squares fit of log-normal distribution.

The Sauer Method (Reference 4) was used to adjust the natural flows to account for the effects of urbanization. This method relates the peak discharge for any return interval to the percentage of impervious area in the watershed and the average rainfall intensity ratio of the 10-, 50- and 100-year storms to the 2-year storm.

Land use for each watershed was determined from aerial photos (Reference 5), USGS quadrangles (Reference 6) and field inspection. The percent impervious area for any given land use was obtained from the SCS, Technical Release No. 55 (Reference 7).

Results of the hydrologic analyses for Locust Fork of Black Warrior River and Payne Branch are presented in Table 1, "Summary of Discharges".

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
LOCUST FORK OF BLACK WARRIOR RIVER					
At Northern Corporate Limits	46.1	5,400	8,700	10,300	13,500
PAYNE BRANCH					
At confluence with Locust Fork of Black Warrior River	2.3	780	1,200	1,400	1,800

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of the flooding sources studied in detail in the Town of Walnut Grove were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each of the flood sources.

Cross sections for the backwater analyses of Locust Fork of Black Warrior River and Payne Branch were obtained from aeral photographs taken in March 1978 at a negative scale of 1.0 inch equals 800 feet. The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations, were chosen by engineering judgement based on field observations of the streams and flood plain areas. Roughness values used for the two streams were 0.03 for the channel and 0.04 - 0.06 for the overbank areas.

Water-surface elevations for floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 8). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals. The starting water-surface elevations for Locust Fork of Black Warrior River and Payne Branch were calculated using the slope-area method.

All elevations are referenced from the National Geodetic Vertical Datum of 1929 (NGVD), formerly referred to as Mean Sea Level Datum of 1929; elevation reference marks used in this study are shown and described on the maps.

Flood elevations in the Town of Walnut Grove, may be raised by debris blockage of the streams in the study area. The hydraulic analyses for this study, however, are based only on the effect of unobstructed flow. The flood elevations as shown on the profiles are thus considered valid only if hydraulic structures in general remain unobstructed and do not fail.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages state and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the FIA as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and the 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:6000 with a contour interval of 4 feet (Reference 9). In cases where the 100- and the 500-year flood boundaries are close together, only the 100-year boundary has been shown.

For the streams studied by approximate methods, the boundary of the 100-year flood was developed from normal depth calculations, the topographic maps referenced above, and information provided by residents along the study streams.

The boundaries of the 100- and 500-year floods are shown on the Flood Boundary and Floodway Map (Exhibit 2). Small areas within the flood boundaries may lie above the flood elevations, and therefore, may not be subject to flooding. Owing to limitations of the map scale and/or lack of detailed topographic data, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity, increases the flood heights of streams, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream plus any adjacent flood plain areas that must be kept free of encroachment in order that the 100-year flood may be carried without substantial increases in flood heights. Minimum standards of the FIA limit such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this report are presented to local agencies as minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodways presented in this study were computed on the basis of equal conveyance reduction from each side of the flood plain. The results of these computations were tabulated at selected cross sections for each stream segment for which a floodway was computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway widths were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the boundaries of the floodway and the 100-year flood are either close together or collinear, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FT.)	SECTION AREA (SQ. FT.)	MEAN VELOCITY (F.P.S.)	REGULATORY (NGVD)	WITHOUT FLOODWAY (NGVD)	WITH FLOODWAY (NGVD)	INCREASE (FEET)
Locust Fork of Black Warrior River								
A	200	1000	5070	2.0	821.2	821.2	822.2	1.0
B	3490	1630/1530[2]	7730	1.3	821.9	821.9	822.8	0.9
C	5670	660	2070	5.0	822.0	822.0	822.7	0.7
D	7500	980	4520	2.3	824.1	824.1	825.1	1.0
E	8320	1220	7260	1.4	826.7	826.7	827.5	0.8
F	8710	1200	6670	1.5	826.8	826.8	827.6	0.8
Payne Branch								
A	630	500	3080	0.5	827.1	827.1	827.3	0.2
B	1240	280	1700	0.8	827.1	827.1	827.3	0.2
C	1650	350/210[2]	2120	0.7	828.4	828.4	829.1	0.7
D	1800	300/170[2]	1560	0.9	828.4	828.4	829.1	0.7
E	2260	160	380	3.6	828.9	828.9	829.4	0.5
F	2720	250	500	2.8	831.1	831.1	831.3	0.2
G	3110	280	2820	0.5	840.5	840.5	841.1	0.6
H	3920	280	1790	0.8	840.5	840.5	841.1	0.6
I	4650	85	330	4.2	840.6	840.6	841.2	0.6

[1]Feet upstream of Northern Corporate Limits for Locust Fork of Black Warrior River; feet above mouth for Payne Branch.
[2]Total width/width within corporate limits

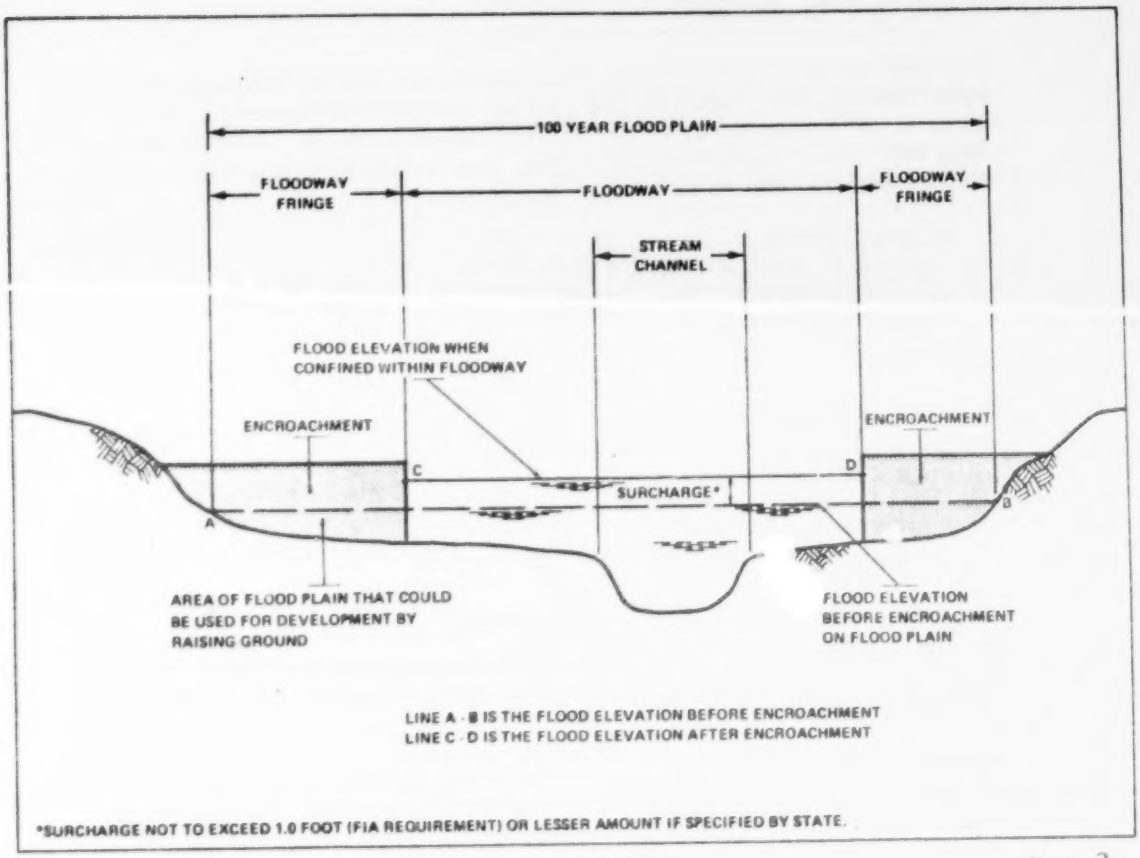
TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF WALNUT GROVE, AL
(ETOWAH CO.)

FLOODWAY DATA

LOCUST FORK OF BLACK WARRIOR RIVER-PAYNE BRANCH


100 YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE A - B IS THE FLOOD ELEVATION BEFORE ENCROACHMENT
LINE C - D IS THE FLOOD ELEVATION AFTER ENCROACHMENT
*SURCHARGE NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

FLOODWAY SCHEMATIC

Figure 2

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the FIA has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors (FHFs), and flood insurance zone designations for each significant flooding source affecting the Town of Walnut Grove.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach.

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7	1.0 foot

Four reaches meeting the above criteria were required for the flooding sources within the Town of Walnut Grove. These included one reach for Locust Fork of Black Warrior River and three reaches for Payne Branch. The locations of the reaches are shown on the Flood Profiles (Exhibit 1).

5.2 Flood Hazard Factors (FHFs)

The Flood Hazard Factor is used to correlate flood information with insurance rate tables. Correlations between property damages from floods and their assigned FHFs are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between the water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year flood water-surface elevations is greater than 10.0 feet, the accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective FHFs, the entire incorporated area of the Town of Walnut Grove was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations.

Zone A: Special Flood Hazard Areas inundated by the 100-year flood, determined by approximate methods; no base flood elevations shown or FHFs determined.

Zones A2, A3, A5 & A7	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to FHFs.
Zone B:	Areas between the Special Flood Hazard Area and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; or areas subject to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

Table 3, "Flood Insurance Zone Data," summarizes the flood elevation differences, FHFs, flood insurance zones, and base flood elevation for each flooding source studied in detail in the community.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for the Town of Walnut Grove is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood flood insurance map preparation guidelines published by the FIA.

6.0 OTHER STUDIES

No other detailed Flood Insurance Studies have been done for the Town of Walnut Grove, Alabama.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the office of the Federal Emergency Management, Agency, Insurance and Mitigation Division, 1371 Peachtree Street, N.E., Suite 778, Atlanta, Georgia 30309.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1.0% (100-YEAR) FLOOD AND			FHF	ZONE	BASE FLOOD ELEVATION[3]
		10% (10 YR.)	2% (50 YR.)	0.2% (500 YR.)			
Locust Fork of Black Warrior River							
Reach 1	0001	-1.7	-0.4	+0.8	015	A3	Varies
Payne Branch							
Reach 1	0001	-2.7	-0.8	+1.6	025	A5	Varies
Reach 2	0001	-0.8	-0.2	+0.5	010	A2	Varies
Reach 3	0001	-3.3	-1.1	+1.5	035	A7	Varies

[1]FLOOD INSURANCE RATE MAP PANEL
[2]WEIGHTED AVERAGE
[3]ROUNDED TO NEAREST FOOT-SEE MAP

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF WALNUT GROVE, AL
(ETOWAH CO.)

FLOOD INSURANCE ZONE DATA

LOCUST FORK OF BLACK WARRIOR RIVER-PAYNE BRANCH

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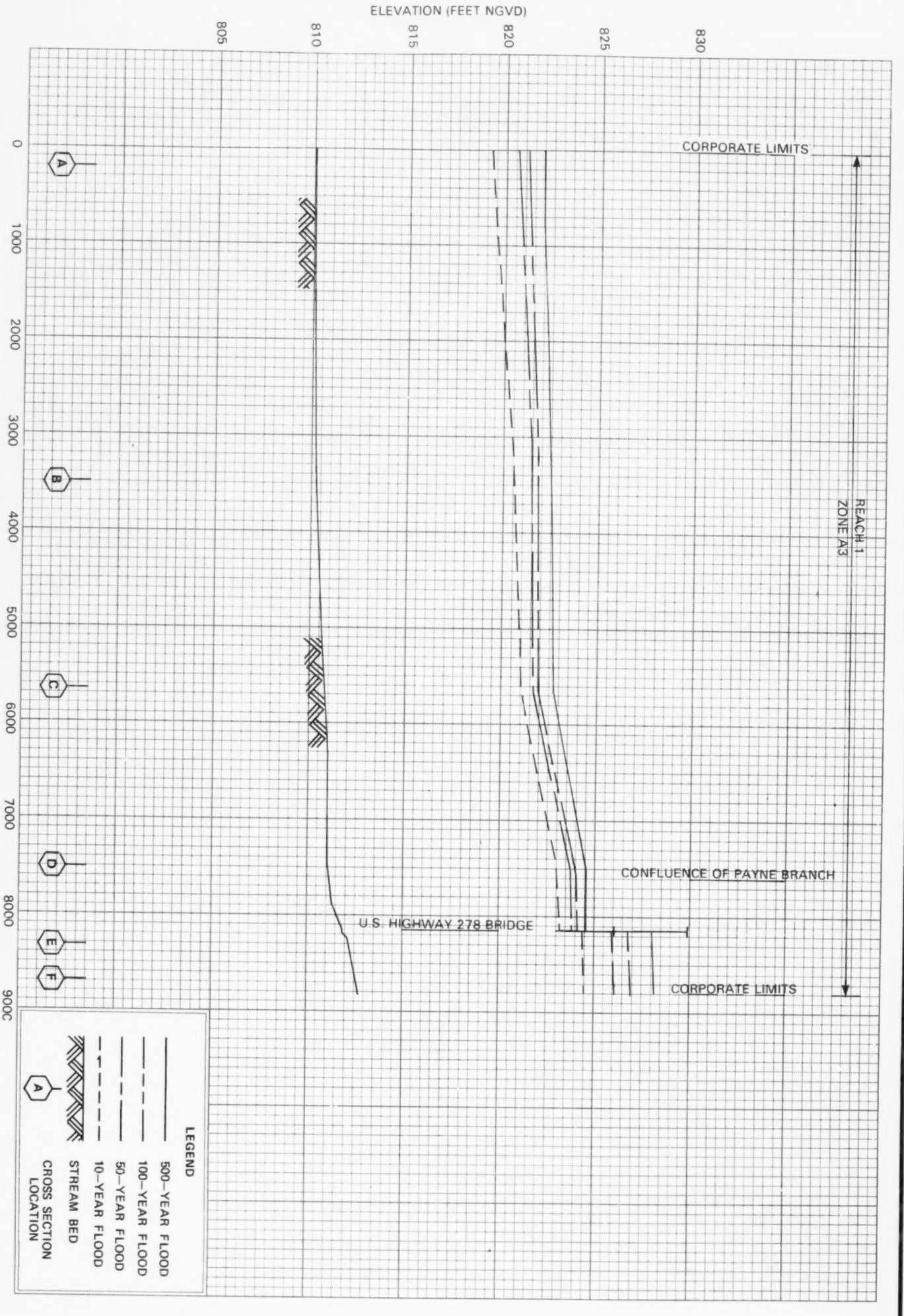

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FLOOD PROFILES

PAYNE BRANCH

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

TOWN OF WALNUT GROVE, AL
(ETOWAH CO.)

02P